

SEQUENCE LISTING

<110> BASF Aktiengesellschaft

<120> GMP synthetase from plants

<130> DE 19947490.7

<140> 0050-50777

<141> 1999-10-01

<160> 4

<170> PatentIn Vers. 2.0

<210> 1

<211> 1973

<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

<222> (65)..(1678)

<400> 1

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Met Glu Pro Gln Thr Gln Ala Lys Lys Ser Asn Leu Val Leu Ile

1 5 10 15

cta gac tac ggt tct cag tac act cac cta atc acc cgc cga atc cga 157

Leu Asp Tyr Gly Ser Gln Tyr Thr His Leu Ile Thr Arg Arg Ile Arg

20 25 30

agc cta tca att ttc tca ctc acc att aac ggc acc tct tcg tta gac 205

Ser Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp

35 40 45

tcc ata aaa gaa ctc gac cca cgt gtc att atc ctc tcg ggt gga ccc 253

Ser Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro

50 55 60

cac agc gtc cac gct gac ggc gca ccg tgt ttc cca cct ggg ttc atc 301

His Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Pro Gly Phe Ile

65 70 75

gaa tac gtc gag tca cgt ggg att cac gtg ttg ggt ata tgt tat ggg 349

Glu Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Ile Cys Tyr Gly

80 85 90 95

ctg cag ttg att gtt cag aaa ctt ggc ggg gtt gtg aaa att gga gag 397

Leu Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu

100 105 110

aaa cat gag tat ggg aga atg gaa att gag gtt gga aag aat gtt gtt 445

Lys His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val

115	120	125	
ggg ggg ttg ttt ggg aat acg gaa att ggt gat aaa cag gtg gtt tgg			493
Gly Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp			
130	135	140	
atg agc cac ggt gat gag gct gtg aaa ttg ccg gaa ggg ttt gag gtt			541
Met Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val			
145	150	155	
gtg gcg agg agt agt cag ggt gct gtt gct gct att gag aat cgg gaa			589
Val Ala Arg Ser Ser Gln Gly Ala Val Ala Ala Ile Glu Asn Arg Glu			
160	165	170	175
cgg agg ttt tat ggg ctg cag tat cat ccc gag gta acg cac tcg act			637
Arg Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr			
180	185	190	
gaa ggg atg aga aca tta aga cac ttt ctg ttt gat gta tgt ggc gtt			685
Glu Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val			
195	200	205	
aca gct ggc tgg aag atg gaa gat gtt ctg gag gaa gaa ata aaa gtt			733
Thr Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Ile Lys Val			
210	215	220	
atc aaa ggt atg gtt gga cct gaa gat cac gtg att tgt gct tta tct			781
Ile Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser			
225	230	235	
ggt ggt gtt gat tcc aca gtt gca gct aaa ttg gta cac aag gct atc			829
Gly Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile			
240	245	250	255
ggg gac agg ctt cac tgt gtt ttt gtt gat aat ggt cta tta agg tat			877
Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr			
260	265	270	
aag gag aga gaa agg gtg atg gaa ctc ttt gag aag cgc ctt cat ttg			925
Lys Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg Leu His Leu			
275	280	285	
cct gtt acc tgt gtc gat gct aca gaa gaa ttt ctc agc aaa cta aaa			973
Pro Val Thr Cys Val Asp Ala Thr Glu Glu Phe Leu Ser Lys Leu Lys			
290	295	300	
ggc gta aca gaa cct gaa atg aag agg aaa ata att ggg aag gag ttc			1021
Gly Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe			
305	310	315	
atc aac ata ttt gat ctt ttt gcc cat gat gtg gag gaa aaa gta ggg			1069
Ile Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Glu Lys Val Gly			
320	325	330	335
aaa aaa cct agt tac cta gtc caa gga acc ttg tat cct gat gta ata			1117
Lys Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile			
340	345	350	

gag tct tgt cct cca cct gga agt gga aga aca cat tct cat aca atc	1165
Glu Ser Cys Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile	
355 360 365	
aag agc cat cat aat gtt gga ggt ctt cca aag gac atg aag ctg aag	1213
Lys Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys	
370 375 380	
ctc atc gag cca ctg aaa ctt cta ttc aag gat gag gtt cgt gaa ttg	1261
Leu Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu	
385 390 395	
gga aag att ttg gat ata tct gag gac ttt ctt aaa cgc cac ccg ttc	1309
Gly Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe	
400 405 410 415	
cct ggg ccc gga ctc gct gtg cga att cca ggt gat gtc aca gca ggg	1357
Pro Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly	
420 425 430	
aat tcc ttg gat att ctt cgt cag gtt gat gaa atc ttc att caa tca	1405
Asn Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser	
435 440 445	
atc aga gat gct aaa atc tat gat gaa ata tgg caa gct ttt gct gtc	1453
Ile Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val	
450 455 460	
ttc tta cca gtg aaa act gtt gga gta caa gga gac caa aga acc cat	1501
Phe Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His	
465 470 475	
tcc cac gct gtt gca ctt aga gca gtc aca agt caa gat gga atg act	1549
Ser His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr	
480 485 490 495	
gca gac tgg tac tac ttt gat ttc aag ttc ctt gac gac gta tca aga	1597
Ala Asp Trp Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg	
500 505 510	
aag atc tgc aat agt gtt cgt ggt gta aat cga gtt ctg ctg gat att	1645
Lys Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile	
515 520 525	
aca tca aag cct cca tca aca atc gaa tgg gaa taatttgta taaagaatgc	1698
Thr Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu	
530 535	
tatatttggt gaccaaagta ggattctttt gtgatttttg gtgcataaca aaaaggaaga	1758
aatcataat agaaatttag gtcccttttgc tatgtggtag aactggttct tgggtaatta	1818
tgtgcaatgc tctcaacaat tttgtatggt tatgggtatg atgataccaa attttactca	1878
gatcttggtg gtacattttt cttatccaag tatagtaaca tgtggccagg catcaaaagc	1938

ctattccact caaaaaaaaa aaaaaaaaaac tcgag

1973

<210> 2

<211> 538

<212> PRT

<213> Nicotiana tabacum

<400> 2

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20 25 30

Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp Ser
35 40 45

Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro His
50 55 60

Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Gly Phe Ile Glu
65 70 75 80

Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Ile Cys Tyr Gly Leu
85 90 95

Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu Lys
100 105 110

His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val Gly
115 120 125

Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp Met
130 135 140

Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val Val
145 150 155 160

Ala Arg Ser Ser Gln Gly Ala Val Ala Ala Ile Glu Asn Arg Glu Arg
165 170 175

Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr Glu
180 185 190

Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val Thr
195 200 205

Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Glu Ile Lys Val Ile
210 215 220

Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser Gly
225 230 235 240

Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile Gly
245 250 255

Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr Lys
 260 265 270
 Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg Leu His Leu Pro
 275 280 285
 Val Thr Cys Val Asp Ala Thr Glu Glu Phe Leu Ser Lys Leu Lys Gly
 290 295 300
 Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe Ile
 305 310 315 320
 Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Lys Val Gly Lys
 325 330 335
 Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile Glu
 340 345 350
 Ser Cys Pro Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile Lys
 355 360 365
 Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys Leu
 370 375 380
 Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu Gly
 385 390 395 400
 Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe Pro
 405 410 415
 Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly Asn
 420 425 430
 Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser Ile
 435 440 445
 Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val Phe
 450 455 460
 Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His Ser
 465 470 475 480
 His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr Ala
 485 490 495
 Asp Trp Tyr Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg Lys
 500 505 510
 Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile Thr
 515 520 525
 Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu
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<210> 3
 <211> 1232

<212> DNA

<213> *Physcomitrella patens*

<220>

<221> CDS

<222> (3)..(1148)

<400> 3

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Glu Asn Val Asp Ser Arg Ile Tyr Ala Leu Gln Tyr His Pro Glu Val	
20 25 30	
acg cac tca gag aaa ggg aca gag act ttg aga cac ttt ttc ctg aat	143
Thr His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn	
35 40 45	
gtc tgc gcc atg aag gct gac tgg cag atg cag aat gtg ttg gag gaa	191
Val Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu	
50 55 60	
gag att aaa aag gtc act gcg acc gtc gcc cca gat gat cat gtt att	239
Glu Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile	
65 70 75	
tgt gca ctc tcc ggg gcc gtg gac tca aca gta gca gct act ctg gtg	287
Cys Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val	
80 85 90 95	
cac cgt gct att gga gat cgc ctt cat tgt gtg ttt gta gat aat ggc	335
His Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly	
100 105 110	
ctt tgc aga tac aag gaa aga gaa aga gtg atg gcc aca ttt gtg aaa	383
Leu Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys	
115 120 125	
gac ctt cat ctg cca gtc act tgt gtg gat gcc act gag cag ttt etc	431
Asp Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu	
130 135 140	
agc aaa ttg aag gcc gtg gta gat cca gag aga aag agg aag atc atc	479
Ser Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile	
145 150 155	
gga gca gag ttt att gca gtc ttt gat gaa ttt tcg cac aga ttg gag	527
Gly Ala Glu Phe Ile Ala Val Phe Asp Glu Phe Ser His Arg Leu Glu	
160 165 170 175	
aga gag att gga aag atg cct gct ttc ctt gtg cag gga aca ctt tat	575
Arg Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr	
180 185 190	
cca gat gtc att gag tcg tgt cct cct cca ggg agc ggg aag tcg cat	623

Pro	Asp	Val	Ile	Glu	Ser	Cys	Pro	Pro	Pro	Gly	Ser	Gly	Lys	Ser	His		
			195					200					205				
tcc	cac	aca	atc	aaa	agt	cat	cac	aac	gtc	ggt	ggc	ttg	ccc	gag	aac	671	
Ser	His	Thr	Ile	Lys	Ser	His	His	Asn	Val	Gly	Gly	Leu	Pro	Glu	Asn		
		210					215					220					
atg	aaa	ttg	aag	ttg	gtt	gag	cct	ctc	aag	tgg	ctc	ttc	aaa	gac	gag	719	
Met	Lys	Leu	Lys	Leu	Val	Glu	Pro	Leu	Lys	Trp	Leu	Phe	Lys	Asp	Glu		
	225					230					235						
gta	cgc	gaa	atg	ggt	gca	ttg	ttg	gat	gta	cct	gtt	tcc	ttt	ttg	aag	767	
Val	Arg	Glu	Met	Gly	Ala	Leu	Leu	Asp	Val	Pro	Val	Ser	Phe	Leu	Lys		
	240				245					250				255			
cgc	cat	cct	ttc	cct	gga	cct	gga	ttg	gcc	gtg	cga	att	ctt	ggg	gat	815	
Arg	His	Pro	Phe	Pro	Gly	Pro	Gly	Leu	Ala	Val	Arg	Ile	Leu	Gly	Asp		
			260					265					270				
gta	act	cag	gac	ggc	gca	ctc	gac	act	atc	cgc	ttg	gtt	gat	gag	atc	863	
Val	Thr	Gln	Asp	Gly	Ala	Leu	Asp	Thr	Ile	Arg	Leu	Val	Asp	Glu	Ile		
		275						280					285				
ttt	gtg	aac	agc	att	cga	gag	gca	ggt	ctt	tac	gat	aag	atc	tgg	cag	911	
Phe	Val	Asn	Ser	Ile	Arg	Glu	Ala	Gly	Leu	Tyr	Asp	Lys	Ile	Trp	Gln		
	290					295					300						
gca	ttt	gct	gtt	tat	ctg	cca	gta	aag	act	gtt	ggc	gtt	caa	ggc	gac	959	
Ala	Phe	Ala	Val	Tyr	Leu	Pro	Val	Lys	Thr	Val	Gly	Val	Gln	Gly	Asp		
	305				310						315						
aaa	cgg	aca	cat	tca	cac	gct	gtt	gct	cta	cgt	gca	att	aca	agt	gaa	1007	
Lys	Arg	Thr	His	Ser	His	Ala	Val	Ala	Leu	Arg	Ala	Ile	Thr	Ser	Glu		
	320				325				330					335			
gac	gga	atg	act	gct	gac	tgg	ttt	cat	ttt	gat	gga	aag	ttt	ctt	gcc	1055	
Asp	Gly	Met	Thr	Ala	Asp	Trp	Phe	His	Phe	Asp	Gly	Lys	Phe	Leu	Ala		
			340					345					350				
gag	gta	tca	tct	aaa	atc	tgc	aac	agc	gta	agg	ggt	atc	aat	agg	gtg	1103	
Glu	Val	Ser	Ser	Lys	Ile	Cys	Asn	Ser	Val	Arg	Gly	Ile	Asn	Arg	Val		
		355						360					365				
gta	tac	gac	att	acg	tct	aaa	cct	cca	tca	act	gtt	gag	tgg	gaa		1148	
Val	Tyr	Asp	Ile	Thr	Ser	Lys	Pro	Pro	Ser	Thr	Val	Glu	Trp	Glu			
		370				375					380						
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<210> 4
 <211> 382
 <212> PRT
 <213> Physcomitrella patens

<400> 4

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20 25 30
His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn Val
35 40 45
Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu Glu
50 55 60
Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile Cys
65 70 75 80
Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val His
85 90 95
Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu
100 105 110
Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys Asp
115 120 125
Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu Ser
130 135 140
Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile Gly
145 150 155 160
Ala Glu Phe Ile Ala Val Phe Asp Glu Phe Ser His Arg Leu Glu Arg
165 170 175
Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr Pro
180 185 190
Asp Val Ile Glu Ser Cys Pro Pro Pro Gly Ser Gly Lys Ser His Ser
195 200 205
His Thr Ile Lys Ser His His Asn Val Gly Gly Leu Pro Glu Asn Met
210 215 220
Lys Leu Lys Leu Val Glu Pro Leu Lys Trp Leu Phe Lys Asp Glu Val
225 230 235 240
Arg Glu Met Gly Ala Leu Leu Asp Val Pro Val Ser Phe Leu Lys Arg
245 250 255
His Pro Phe Pro Gly Pro Gly Leu Ala Val Arg Ile Leu Gly Asp Val
260 265 270
Thr Gln Asp Gly Ala Leu Asp Thr Ile Arg Leu Val Asp Glu Ile Phe
275 280 285
Val Asn Ser Ile Arg Glu Ala Gly Leu Tyr Asp Lys Ile Trp Gln Ala
290 295 300

Phe Ala Val Tyr Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Lys
305 310 315 320

Arg Thr His Ser His Ala Val Ala Leu Arg Ala Ile Thr Ser Glu Asp
325 330 335

Gly Met Thr Ala Asp Trp Phe His Phe Asp Gly Lys Phe Leu Ala Glu
340 345 350

Val Ser Ser Lys Ile Cys Asn Ser Val Arg Gly Ile Asn Arg Val Val
355 360 365

Tyr Asp Ile Thr Ser Lys Pro Pro Ser Thr Val Glu Trp Glu
370 375 380